

CLAIMS

- 2 *Sub B*
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1. A lubrication system for an expendable gas turbine engine comprising:  
a gas turbine engine having a rotatable shaft;  
bearings journalling said shaft for rotation about an axis;  
a tank;  
a bladder within said tank;  
a source of gas under pressure;  
one of said tank and said bladder containing lubricating oil for said bearings;  
the other of said tank and said bladder being connectable to said source of  
gas under pressure;  
a conduit extending from said one of said tank and said bladder containing  
lubricating oil to said bearings;  
a solenoid operated valve in said conduit and operable only to either fully  
open or fully close; and  
a control circuit for pulsing said solenoid at a controlled rate to alternately  
(a) allow oil flow and (b) halt oil flow to said bearings for a time insufficient to cause oil  
starvation of said bearings.

2. The lubrication system of claim 1 wherein said one of said tank and said  
bladder is said tank.

3. The lubrication system of claim 1 wherein said one of said tank and said  
2 bladder is said bladder.

4. The lubrication system of claim 1 wherein said time is no more than about  
2 three seconds.

5. The lubrication system of claim 1 further including a metering orifice in said  
conduit between said bearings and said solenoid valve.

6. The lubrication system of claim 1 further including a pressure regulator  
operatively interposed between said other of said tank and said bladder on the one hand  
and said source of gas under pressure on the other hand.

7. The lubrication system of claim 6 wherein said pressure regulator receives  
2 an input representative of pressure at said bearings.

8. The lubrication system of claim 1 wherein said engine is mounted in a  
2 vehicle and said control circuit receives inputs representative of vehicle velocity and  
temperature of the lubricating oil.

9. The lubrication system of claim 1 wherein said vehicle is an airborne  
2 vehicle and said control circuit receives an input representative of the altitude of the  
vehicle.

10. The lubrication system of claim 1 wherein said tank is in sufficiently close  
2 proximity to said engine so as to receive heat rejected thereby so that lubricating oil is  
warmed by engine operation to reduce its viscosity.

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*Sub B3*  
11. A lubrication system for an expendable gas turbine engine in an airborne  
vehicle engine comprising:  
a turbojet engine having a rotatable shaft;  
bearings journalling said shaft for rotation about an axis;  
a tank;  
a bladder within said tank;  
a source of gas under pressure;  
one of said tank and said bladder containing lubricating oil for said  
bearings;  
the other of said tank and said bladder being connectable to said source of  
gas under pressure;  
a pressure regulator interconnecting said source of gas under pressure  
and said other of said tank and said bladder;

14 a conduit extending from said one of said tank and said bladder containing  
lubricating oil to said bearings;

16 a solenoid operated valve in said conduit and operable only to either fully  
open or fully close;

18 a metering orifice in said conduit between said solenoid operated valve  
and said bearings;

20 a control circuit for pulsing said solenoid at a controlled rate to alternately  
22 (a) allow oil flow and (b) halt oil flow to said bearings for a time insufficient to prevent oil  
starvation of said bearings; and

24 said control circuit receiving inputs representing vehicle velocity, vehicle  
altitude and lubricating oil or ambient temperature.

2 12. The lubricating system of claim 11 wherein said pressure regulator is  
connected to receive a control input representing pressure at said bearings.

Sub B4 2 13. A lubrication system for an expendable gas turbine engine comprising:  
4 a gas turbine engine having a rotatable shaft;  
6 bearings journalling said shaft for rotation about an axis;  
a vessel containing lubricating oil;  
a conduit extending from said vessel to said bearings;  
a solenoid operated valve in said conduit and operable only to either fully  
open or fully close; and

**Q**uestions **A**nswers